dio curtius, rectum, anantherum; antheræ per paria approximatæ, lobi lineares, obtusi, segregati, divaricatissimi, connectivo apicali obtuso breviter excurrente; ovarium conico-oblongum, glabrum, disco latiusculo carnoso impositum; stylus subtenuis, 5 poll. long.; stigmatis lamellæ cuneato-oblongæ, rotundatæ, 3 lin. long., glabræ; fructus vix notus, oblongus, verisimiliter ei *T. albiflorœ* consimilis, ut dixit cl. Plum. (*loc. cit.*), "capsulam vulgi repræsentat, quam Tobacco replent, secumque portant."

With this will cease, for the present, my communications on the *Bignoniaceæ*, as I learn from Dr. Seemann that he has resumed his inquiries into that family, and is about to publish the results of his investigations. The respect I have for that zealous botanist, together with the desire on my part to avoid contravention, and the knowledge that he has long studied the subject, induce me to cede to him the priority. As he has the advantage of consulting collections to which I have no means of access, more may be anticipated from his exertions. I reserve to myself, however, the right of resuming the subject at a future time, and of carrying out my original plan of defining the limits of the genera and subgenera I have sought to establish upon features hitherto unobserved, and also of illustrating their characters by drawings of one or more species of each group, accompanied by analytical figures of the flower, fruit, and seed.

XII.—*Observations on British Protozoa and Zoophytes.* By T. Strethill Wright, M.D., F.R.C.P.E., Pres. Roy. Phys. Soc. Edin.

[Plates III. IV. & V.]

On the Reproduction of Ophryodendron *.

Ophryodendron abietinum, which I have figured in various attitudes in Pl. III., has been noticed elsewhere by Claparède and Lachmann † and myself ‡, several years since; but it was not until the spring of the present year that I was able to discover its mode of reproduction. The animal presents the appearance of an oblong sac filled with homogeneous and finely molecular matter, and is found attached to the corallum of *Sertularia pumila*. From one end of the body or sac arises a proboscis, generally appearing as a short and closely-wrinkled club, but

* Read to the Royal Physical Society of Edinburgh, April 24, 1861.

† Etudes sur les Infusoires et les Rhizopodes, par Edouard Claparède et Johannes Lachmann.

‡ Edinb. Phil. Journal, July 1859.

capable of being produced to a remarkable distance as a glassy ribbon surmounted by numerous twining tentacles. The sac usually shows no trace of a nucleus or contractile vesicle, nor are its contents differentiated into an external and internal tissue (ectosarc and endosarc), as in *Actinophrys* and others of the class ("Acinétiens") into which it has been introduced. The structure of the proboscis differs from that of the sac in the development within it of a clear and highly refractive tissue, corresponding to the muscular element in the branches of *Zoothamnium* and in the more directly contractile pedicle of *Zooteirea*. In the proboscis of *Ophryodendron*, as in the body of *Epistylis*, the contraction of the muscle throws its outer covering into close folds. The tentacles are formed of a continuation of the contractile tissue of the proboscis, and are covered to within a short distance of their tips by the integument. The proboscis, when extended, hangs suspended or floating in an erect position, or slowly swims about in large curves by the continuous and very active motion of its tentacles. This animal may be called the homomorph, amongst the Protozoa, of *Sipunculus Bernhardi*. I have never been able to satisfy myself as to its mode of feeding, though portions of matters are occasionally seen entangled amongst the tentacles, and apparently pressed in contact with the substance of the proboscis.

In the sketch of this animal appended to my notice of 1859, I figured several globular bodies within the sac, which my friend M. Claparède, to whom I showed it, had not observed; and on further observation I was led to consider the figure erroneous. In March last, however, the *Ophryodendra* (Pl. IV. fig. 1) again contained these bodies; and by a somewhat "meddlesome midwifery," I was enabled to force them from the sacs, and to find that they were living young, from four to nine in number.

The young thus obtained consist of ovoid bodies of higher refractive structure than the body of the parent, and contain olive-brown corpuscles, shaped like the chlorophyll-granules of *Hydra viridis*. At a later stage, when the wrinkled trunk of the parent hung lax and dead, the young larvæ assumed a pyriform shape, flattened on their inferior surface (Pl. IV. fig. 2). This surface was also marked with longitudinal striæ, carrying short, soft, slowly-moving cilia or processes. Their natural mode of extrusion was not observed; but several families of them were found, each enveloped in a soft gelatinous ball, and attached to the *Sertularia* and other bodies. Single individuals were seen slowly moving on the zoophyte; and others attached were putting forth the rudiments of the proboscis. The proboscis was at first finely molecular, like the contents of the sac, unwrinkled, and non-contractile. A few tentacles were presently put forth from

its summit (fig. 3); and it gradually assumed the structure of that of the adult.

The body of *Ophryodendron* frequently bears fusiform bodies, from one to four in number, which I have already described, and which appear to be gemmæ.

EXPLANATION OF PLATES III. & IV. figs. 1–3.

Pl. III. Two cells of *Sertularia pumila* on which *Ophryodendra* are attached,—the figure on the left side of the centre with gemma and contracted proboscis, that on the right side of the centre with proboscis extended; the trunks of two others are shown in various states of extension.

Pl. IV. figs. 1–3. Young of *Ophryodendron* in various stages of development.

On Dendrophrya radiata *and* D. erecta (nov. gen. et sp.)*.

The Rhizopodous animals to which I have given the name of *Dendrophrya* are found plentifully on Sertularias, Flustras, Fuci, and stones, in low-water pools at Granton Quarry, near Edinburgh. There are two species, *D. radiata* and *D. erecta.*

D. radiata.

Its general appearance is that of a small shelly mass, from the borders of which radiates a system of branched membranous tubes, more or less coated with mud or other matters. In young specimens the central shell is absent, and the animal presents the appearance of an irregular system of branches radiating from a centre. The shape of the adults is very various, and depends on the surface to which they are attached; they attain sometimes a diameter of nearly a quarter of an inch, though generally much smaller. The shell is not acted on by acids, and is therefore silicious. The animal itself can seldom be detected, as it lies concealed within its central flinty stronghold and the complicated system of earthworks surrounding it.

D. erecta.

In this species, found on stones, the branched, membranous and mud-clothed tubes, instead of creeping over the surface to which the animal is attached, spring upwards and outwards, as in Pl. IV. fig. 4. Delicate pseudopodia, linear or forked (figs. 4 and 5), are readily observed to protrude themselves from the extremities of the branches, accompanied sometimes by lobular processes of the sarcode of the animal. The patelloid shell of *D. erecta* may be easily detached from its seat, and its tenant, a small patch of semitransparent sarcode, scooped out with a flat-pointed needle and transferred to the stage of the microscope. It differs from the sarcode of other Rhizopods in being filled

* Read to the Royal Physical Society of Edinburgh, April 24, 1861.

with delicate short fibres instead of the usual molecular matter, and contains, both within the shell and tubes, the highly refractive bodies I have mentioned in a former paper as ova.

EXPLANATION OF PLATE IV.

Fig. 4. *Dendrophrya erecta*, seated on a portion of stone, and showing pseudopodia projecting from summits of branches.

Fig. 5. Summit of one of the tubes of *D. erecta*, with projecting lobes of sarcode and pseudopodia.

On Lecythia elegans (nov. gen. et sp.).*

This animal, of which I give drawings in Pl. V. fig. 10, is found on *Sertularia pumila*. It is exceedingly minute, and requires high microscopic power and careful adjustment of light for its accurate definition. The body is flask- or carafe-shaped, mounted on a long, fine, rigid pedicle, and enclosed in a closely fitting envelope. The summit of the body is dilated, and furnished with a variable number of long, slender, divergent processes or tentacles, which appear to correspond with those of *Actinophrys*. When the tentacles are contracted, they become capitate, and assume the form of a bossed crown, as shown in the figure.

In the following part of this paper the term '*polypidom*' is used (with Johnston) to signify the chitinous envelope of zoophytes; the term '*polypary*,' the living communicating substance from which the polyps spring—the 'cœnosarc' of Allman; the term '*generative sac*,' the cavity, formed of the two constituent membranes of the zoophyte, which contains the 'generative elements'—ova or spermatozoa; and '*placenta*,' the layer of 'endoderm' in the generative sac, from which the generative elements are developed, and by which they are nourished.

Cionistes reticulata (nov. gen. et sp.)†.

Polypidom retiform; alimentary polyps sessile, minute, white, with a single row of short tentacles; reproductive polyps columnar, thickened towards the apex, not terminated by a cluster of thread-cells, bearing many generative capsules.

A male specimen of this zoophyte was found growing on an old shell at Granton, in May 1857. It differs from the *Eudendrium confertum* of Alder (the *Dicoryne* of Allman) in the absence of the dense clusters of large thread-cells which terminate the

* Read to the Royal Physical Society of Edinburgh, April 24, 1861.

† Read to the Royal Physical Society of Edinburgh, March 23, 1859; now rewritten.

summit of the reproductive polyp of the latter, and which are the last rudiments of tentacles. The polypidom consists of a close network of flattened tubes, from out of which the alimentary and reproductive polyps spring at distant intervals. The sperm-sacs (one of which is shown in the margin at fig. 1, attached to the reproductive polyp) differ from those of *Hydractinia* in having the endoderm attached to the ectoderm at their distal extremities, as I have figured elsewhere (Edin. Phil. Mag. Jan. 1859) in the sperm-sac of *Eudendrium rameum*. This zoophyte resembles the Sertulariadæ in the simple columnar form of its non-tentacled reproductive polyps, and forms the connecting link between these organs in the Tubulariadæ and Sertulariadæ. It exhibits the most degraded form of the reproductive polyp, previously to the latter being altogether dispensed with and the generative sacs being developed directly from the polypary. Thus we have, in the chain of degradation,—

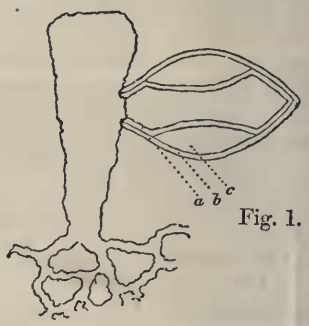


Fig. 1.

Reproductive polyp of *C. reticulata* with single sperm-sac: *a*, endoderm; *b*, ectoderm; *c*, cavity containing spermatozoa.

Generative sacs or medusoids attached to ordinary alimentary polyp, as in	*Clava*, *Coryne*, &c.
Generative sacs attached to reproductive alimentary polyp, which differs from ordinary alimentary polyp in having fewer tentacles	*Podocoryna fucicola* (Sars).
Generative sacs attached to reproductive polyp with rudimentary mouth and tentacles, as in	*Hydractinia echinata*.
Generative sacs attached to reproductive polyp without mouth or tentacles; summit of polyp surmounted by a cluster of large thread-cells, as in	*Eudendrium confertum* (Alder).
Generative sacs or medusoids attached to reproductive polyp without mouth, tentacles, or cluster of thread-cells, as in	*Cionistes*, *Sertularia*, *Campanularia*.
Reproductive polyp divided longitudinally into several portions, each surmounted by its cluster of large thread-cells; sperm-sacs formed, as in *Hydra*, by simple dilatation of the ectoderm; each division of polyp transformed into a 'moniliform' sperm-sac, as in	*Eudendrium arbusculum* (T. S. W.), *E. capillare*? (Alder).
Generative sacs or medusoids attached to the polypary, as in	*Atractylis* (T. S. W.), *Hydractinia* (Alder and T. S. W.), *Cordylophora* (Allman).

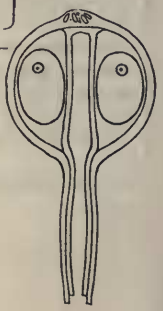
It will thus be seen that there is a very gradual transition from the alimentary polyp to the reproductive polyp, and from the latter to the simple generative sac. Prof. Allman's term 'blastostyle,' applied to the reproductive polyp, is apt to mislead, as it indicates that the alimentary and reproductive polyps are not homologous parts. Still more decidedly does that accomplished naturalist confuse the homology of these parts by applying the same term to the branched pedicle of the aggregated generative sacs of *Tubularia indivisa*, which is merely formed of the conjoined and elongated pedicles of the individual sacs.

It is impossible to construct any classification of the Hydroid Zoophytes on the form or position of their generative sacs or medusoids, as these vary not only in different species of the same genus, but also in males and females of the same species. Thus, in *Eudendrium rameum* the sperm-sacs are moniliform, the egg-sacs single; the former are attached to the alimentary polyp, the latter to the polyp and also to the polypary. In *Hydractinia*, although the generative sacs generally spring from the reproductive polyps, they are also found attached to the polypary; and in a most interesting species of this genus lately discovered by Mr. Alder, medusoids spring from the latter part of the zoophyte. In *Atractylis ramosa*, T. S. W. (*Eudendrium ramosum*, Van Ben.), the medusoids, the males and females of which differ in shape, spring from the polyps, from club-shaped bodies, and from the polypary; in other species of *Atractylis* they arise from the reticulated base of the zoophyte. In certain species of the genera *Sertularia* and *Campanularia*, marsupial forms occur which bear no homological relation to each other.

The gradual transition in the Hydroidæ from the simple generative sac to the perfect Medusa is exceedingly interesting. I attempt to indicate it in the following sketch :—

Generative elements (spermatozoa or ova) contained in a simple generative sac or dilatation of the ectoderm; *placenta* formed of endodermal floor of sac	*Hydra.*	Simple generative sac.
Placenta protruding into generative sac, and forming 'spadix' (Allman) surrounded by generative elements	*Coryne*, *Hydractinia.*	
— or branched and permeating them.....	*Campanularia lacerata* (male).	
— or folding round single ovum.....	*Eudendrium rameum* (female).	

Placenta adherent to summit of generative sac; summit of sac furnished with cluster of large thread-cells; sac the equivalent of the peduncle of *Coryne gravata*	*Eudendrium arbusculum* (male). *E. confertum* (female*).	Generative sac become a peduncle ('manubrium,' Allman).
Summit of sperm-sac furnished with a row of tentacles indicating the presence of a non-differentiated subumbrella	*Laomedea Loveni* (male).	Subumbrella present, but not differentiated.
Generative sac transformed into a free walking medusoid; peduncle furnished with branched tentacles, as in *Bougainvillea*; subumbrella not differentiated, its presence indicated by eye-specks and otoliths; umbrella absent	*Eleutheria*, medusoid of *Clavatella* (Hincks).	
Ovisac fixed, enclosed in a differentiated subumbrella with lateral and circular canals and tentacles	*Laomedea Loveni* (female).	Subumbrella differentiated.
Sperm-sac surmounted with large thread-cells, and forming the peduncle of a fixed medusoid with differentiated subumbrella and umbrella	*Coryne gravata.*	Umbrella differentiated.
Imperfect free Medusa; peduncle with tubular mouth, and united with a single-cavitied generative sac	Medusa of *Coryne decipiens*, *Sarsia.*	Peduncle or alimentary polyp and generative sac not differentiated from each other (see *post*).
Perfect free Medusa of low type; peduncle four-tentacled or lipped, and containing eight generative sacs coalescing into four, which are situated alternately with the tentacles or lips	*Bougainvillea Britannica*, the Medusa of *Atractylis ramosa* (female). *Turris neglecta*, the Medusa of *Clavula Gossii* (female).	Generative sacs differentiated from alimentary polyp, but situated on it.
Perfect free Medusa of low type; peduncle four-lipped or tentacled, with eight distinct generative sacs, one placed on the side of each lip	*Oceania episcopalis.*	



* In the ovisac of *E. confertum* (see figure in margin), which I have had an opportunity of examining through the kindness of Mr. Alder, the endoderm and ectoderm at first adhere together at the summit of the sac, and at this point a few large thread-cells occur in the ectoderm. A similar occurrence of adhesion and thread-cells is found in the sperm-sac of *E. arbusculum*, and also in the false and mouthless peduncle of the medusoid of *Coryne gravata*.

Perfect free Medusa of higher type; peduncle four-lipped or tentacled; eight generative sacs, one on each side of lateral canals	*Medusa of Laomedea geniculata.*	Peduncle and generative sacs differentiated. Alimentary polyp taking no part in reproduction.
Medusa of highest type, with 4–6 lips and 8–12 lateral canals, each canal carrying a single generative sac	*Stomobrachium octocostatum.*	Generative sacs on separate canals; two canals corresponding to each lip.

Of the generation of *Stomobrachium* we know nothing. Claparède has shown that gymnophthalmatous Medusæ may produce Medusæ without the intervention of the polypoid phase; but it is impossible to draw any line of distinction between a Medusa and the medusoid phase of the Hydroid polyp. *Tubularia indivisa* produces its young as perfect polyps without the intervention of the planuloid phase, *Clava* with the intervention of that phase. In the life-history of the Hydroidæ any phase—planuloid, polypoid, or medusoid—may be absent.

The perfect several-lipped Medusa appears to be a symmetrical organism composed of eight or more elements, each element corresponding to the half of a lip. Each of these elements is composed of three subelements, the alimentary, reproductive, and prehensile, any of which may be suppressed, or unite with others of different value on the same element, or of the same value belonging to neighbouring elements. Thus, in *Sarsia* the peduncle appears to consist of a single alimentary subelement, and the single reproductive element or generative sac extends around and along the whole of it except the single trumpet-shaped lip. This lip is occasionally placed on one side and at some distance from the extremity of the peduncle, indicating the asymmetrical character of the latter organ in this genus. In *Euphysa* and *Eleutheria* the ovisacs coalesce, and are placed within and at the base of the peduncle. *Steenstrupia* and *Saphenia* furnish examples of the suppression of certain of the marginal tentacles or prehensile subelements, and the exaggeration of others.

The Polyp of the Hydroid Zoophyte must also be considered as composed of one or more elemental zooid. Thus we have the zooid of a single element in the 'tentacular polyp' of *Hydractinia*; the zooid of two elements in the two-tentacled and two-lipped *Lar Sabellarum* (Gosse) (Pl. V. fig. 8), and in the minute two-lipped and non-tentacled polyp which occurs on the Anten-

nularias and others; the zooid of several elements in the five-lipped polyp of *Trichydra* (T. S. W.); that of many elements in the polyp of *Tubularia indivisa*, which I have elsewhere shown to be formed by the confluence of the several distinct tubes of which the polypary or cœnosarc is composed, each of which tubes may be traced, by its coloured endodermal ridges, to the mouth of the polyp, and bears its own system of tentacles and reproductive apparatus.

The compound character of the *polypary* is also seen in *Halecium* and *Antennularia*, and in a very beautiful manner in the very early state of *Sertularia pumila*, which (after it had been kept a few days in fresh water) I have figured with the camera in Pl. V. fig. 12. Its resemblance to Carus's figure of the Medusa, *Cunina globosa* (Esch.), which I have copied in fig. 11, is very striking.

As the Medusa is a multiplex organism, we must inquire how far it is homologous with the generative sac of the Hydroid Zoophyte.

Prof. Allman, in his paper on *Cordylophora* (Phil. Trans. vol. cxliii.), advanced the doctrine that the generative sac was homologous with the whole Medusa—a doctrine based upon an erroneous conception of the cavity in which the generative elements are contained. In a "Note on Dicœcious Reproduction in Zoophytes" (Edin. New Phil. Journ. vol. iv. p. 88), I stated that "the reproductive buds [generative sacs] (of *Coryne*) were filled with ova developed from the exterior of a hollow central stalk, a diverticulum of the alimentary canal;" and further, "The *peduncle* of the Medusa-bud [or budded Medusa] appears to me to be homologous with the entire reproductive capsule [generative sac] (of *Coryne glandulosa*, &c.)." This view is now adopted by Prof. Allman, who writes, in this Journal (vol. vi. 3 ser. p. 4), "The manubrium is the whole of the 'peduncle,' 'stomach,' or by whatever other name it may be called, which depends from the centre of the umbrella in a Medusa or medusoid; and I apply the same term to what I consider the homologous part in a sporosac, namely the whole sporosac *minus* the ectotheca and mesotheca." Now, the 'sporosac,' less the 'ectotheca' and 'mesotheca,' is the simple generative sac, which therefore Prof. Allman has agreed with me in considering homologous with the peduncle.

But I would now very much modify the above view. We must keep in mind that each of the eight elements of a medusoid has three distinct functional subelements; that the single reproductive subelement of the Medusa exists, as in *Stomobrachium*, uncombined; that where the peduncle is the reproductive organ of a *free* Medusa, as in *Sarsia*, it consists of two subelements

of different function combined, each exercising its separate function, alimentative or reproductive; that an organ composed of a single subelement (a generative one) having only one function cannot be homologous with one composed of two subelements (peduncle of *Sarsia*) each having its distinct function, or with an organ of sixteen subelements (peduncle of *Bougainvillea*), eight of which are alimentary and eight reproductive. I would therefore now state—

That the simple generative sac of *Coryne* is homologous with the reproductive subelement or single generative sac as it exists on the lateral canal of *Stomobrachium*.

That the peduncle-like sac of *Eudendrium confertum* is homologous with the *reproductive* subelement in the peduncle of *Sarsia*—not with the whole peduncle.

That where the generative sac evidently consists of many subelements, as in *Tubularia larynx* and *Sertularia fallax* (evidenced by the four summit-lips or lobes, the symmetrical character of each of which indicates it to be composed of two subelements), it is homologous with the *reproductive* subelements in the octopartite peduncle of *Bougainvillea*, or, rather, with the eight coalescing *reproductive* subelements of *Eleutheria*.

I consider that a four-lobed or branched state of the placenta or spadix indicates a multipartite constitution of the generative sac, and not a rudimentary medusoid form of that organ; for we have, in the fixed female medusoid of *Laomedea Loveni*, a four-lobed condition of the placenta in the peduncle-like ovisac, with the existence of a well-differentiated subumbrella and lateral and circular canals.

My space will not allow me to illustrate the homological relations which exist between the polypary (or cœnosarc) and the polypidom, on the one hand, and the subumbrella and umbrella on the other. This must be reserved for a future occasion, when I hope to fill up the gaps in this rough and incomplete sketch of some of the morphological relations of the Hydroidæ and their Medusæ.

Atractylis palliata, n. sp. Pl. IV. fig. 6.

Polypidom creeping, closely reticulate. Polyps fusiform, shortly stalked, minute, white, with eight alternating tentacles; body of polyp clothed with a thick layer of 'colletoderm.' Free medusoids springing from meshes of polypary, with four-lipped peduncle; four lateral canals; two long marginal tentacles and two tentacular tubercles alternately placed.

This zoophyte was found on a shell inhabited by *Pagurus Bernhardus*, at Granton. When first observed, its closely-set and dense white polyps, surrounded by their gelatinous envelopes,

were mistaken for a mass of minute ova. These envelopes cover the whole of the body of the polyps up to the border of the mouth, and consist of an exaggerated development of the gelatinous coat which probably exists on the polypidom and body of all the Hydroidæ, in some as a delicate epidermis, in others (as in *Bimeria vestita* and the subject of this notice) as a thick, imputrescible coat—the "colletoderm."

The Medusoids (Pl. IV. fig. 7) are of great size when compared with the very minute polyp, and resemble exactly those of *Atractylis repens*. I have not witnessed any further development in them after their separation from the zoophyte. In those of *A. repens*, when kept alive for some time, the two tentacular tubercles put forth short tentacles, and four other tubercles appear on the marginal canal, as shown in fig. 8,—a change analogous to that undergone in *Bougainvillea Britannica*.

Atractylis coccinea, n. sp.*

Polypidom creeping, widely reticulate. Polyp fusiform, set at an obtuse angle to its stalk, rich crimson or pink, with eight alternating tentacles, four long and four short.

This zoophyte was found at Inch Garvie in August last, growing on the roots of *Laminaria saccharina*. The polypary consists of an open network of milk-white fibres, which closely invests the branches of the root. From this network the polyp-stems are given off, each about a quarter of an inch in length, of a rich pinkish cream-colour, and bearing at its summit a single crimson polyp with a double row of transparent colourless tentacles. The body of the polyp is fusiform, sometimes nearly cylindrical, and consists of an endoderm having its cells laden with granules of the richest carmine-colour, covered by an ectoderm of transparent white—a white blond dress over a crimson satin petticoat. The polyps, like others of this class, have the habit of turning themselves inside out, when the internal surface of the deep-coloured velvety endoderm is readily observed. On such occasions masses of granular matter are frequently ejected, which are composed of small pigment-globules filled with crimson fluid. The tentacles are eight in number, four of which are long and held nearly erect, and alternate with the rest, which are shorter and more expanded. The thread-cells are inconspicuous.

This beautiful little zoophyte, when seen with a single lens, presents a perfect garden of minute animal flowers covering the roots of the sea-weed. The reproductive apparatus was not observed.

Hydractinia echinata.

In a former number of this Journal (vol. iv. ser. 3. p. 50) Prof. Allman has remarked, with regard to *Hydractinia*, that "the

* Read to the Royal Physical Society of Edinburgh, Feb. 27, 1861.

solid chitinous polypary [polypidom] is covered externally by the cœnosarc [polypary], thus reminding us of the sclerobasic corallum of some of the Actinozoa." This doctrine had been previously promulgated by Quatrefages (Ann. des Sc. Nat. xx. 232), who considered the polypidom to be an endoskeleton deposited in the substance of the polypary, like the solid axis of *Gorgonia*. If this view were correct, it would not only remove *Hydractinia* from the Tubulariadæ, but would segregate it from the whole of the Hydroid Zoophytes, not one of which is destitute of an investing polypidom.

In the 'Edinb. Phil. Journal' for April 1857, I stated, in a paper on *Hydractinia*, my conviction of the incorrectness of Quatrefages's opinion, and that the mode of secretion of the polypidom of *Hydractinia* did not differ from that of the rest of the Tubulariadæ, as was seen in the development of its young and its propagation by stolons. Since then I have come to the following conclusions, after the examination of a very large number of specimens, some hatched from the egg and adherent to glass, others removed as cuttings from adult specimens and transplanted on glass, to which they readily grow, and others removed entire from the shell of the *Pagurus* by acid, and put up in spirit or balsam.

The *polypidom* and *polypary* are found in the following forms, all of which are frequently combined in the same specimen :—

1. An open network of delicate chitinous tubes without spines, enclosing a polypary composed of several combined endodermal tubes surrounded by a single layer of ectoderm. Found in very young specimens, or in old ones growing on protected parts of the shell. (Analogous to *Clava repens* (mihi), the *C. discreta* of Allman.)

2. An open network as in the last; the tubes of thick brown chitine, with single hollow spines rising from a single tube, or from the confluence of four tubes.

3. A close reticulate plate, as in *Clava cornea* (mihi) and *C. membranacea* (mihi), formed from states 1 or 2 by the continual filling-up of the meshes by anastomosing branches, with or without spines.

4. A fleshy plate of ectoderm permeated by a network of endodermal tubes, and covered above and below by a delicate investment of chitine. Found on the growing borders of the zoophyte, and especially in cuttings of old specimens transferred to glass.

The *spines* are composed of one tube or many parallel tubes: they may be single (Pl. V. fig. 4), and developed on a single tube of the polypidom, like those of *Podocoryne fucicola*; single at their summits and of several tubes at their base (figs. 5 & 6);

composed entirely of several (8–12) conjoined tubes (fig. 7); reticulate by the lateral anastomosis of their tubes; or consisting of long ridges of tubes reared against each other.

The polyps spring from one or several confluent tubes of the polypary; they are covered at their origin, and for a little distance above it, by a delicate prolongation of the polypidom. This may be detected by dyeing the whole zoophyte with tincture of kino, which gives different tints to its chitinous and fleshy elements, or by steeping it alternately in spirit and water, when the coverings of the polyps and polypary become inflated as in figs. 2 & 3.

The *polyps* are of several shapes and functions, which I have described in the paper cited above. It will be sufficient to enumerate them here:—

1. Alimentary polyps, with mouth and tentacles.
2. Reproductive polyps, with rudimentary mouth and tentacles.
3. Spiral polyps—a modification of the last; generally barren (fig. 3).
4. Sessile generative sacs of the polypary.
5. Tentacular polyps, or great tentacles of the polypary (fig. 2).

In the reproductive organs of *Hydractinia* there is a gradual transition from the reproductive polyp to the sessile generative sac; the polyp loses its dot-like mouth, its tentacles, its head or upper part, and finally dwindles down to a mere sperm-sac. This change is generally seen in those specimens which have long been kept in captivity. In these specimens, too, many of the alimentary polyps are often converted into large inflated sacs destitute of mouth and tentacles, and showing through their parietes white longitudinal ridges, which indicate the number of zooid elements of which they are composed.

In the natural history of this remarkable zoophyte there are other points of peculiar interest, which, having already described, I need only mention here:—the slow development and unique shape of the planuloid larva; the powerful muscular structure of the polyps, especially the spiral ones, the office of which last has yet to be discovered; and the intimate sympathy and combined action which subsist between the various parts of the whole animal.

Halcampa Fultoni, n. sp. (a parasitic Actinia).

In a late volume (vi. p. 432) of this Journal appears an account of a parasitic Actinia, *Philomedusa Vogtii*, by Herr Fritz Müller. In 1858 I took a parasitic Actinia which evidently belongs to the same genus. The following account of it is extracted from the 'Proceedings of the Royal Physical Society,' published in the 'Witness' on the 16th of May 1860. It was

there denominated '*Peachia Fultoni*,' but it evidently belongs to the genus *Halcampa* (Gosse).

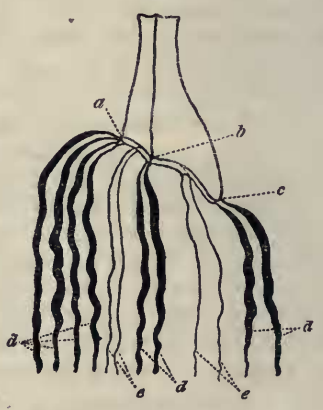
"The author stated that, in the summer of 1858, he took, by dipping, a great number of Medusæ of the genus *Thaumantias*, off Granton Pier. To the peduncle of one of these was attached a small Actinia, about half an inch in length and one-eighth of an inch in diameter. From its general appearance he considered it to be a young specimen of *Actinia troglodytes*, which had been seized by the Medusa, dragged from its native mud, and brought captive to the surface of the water; but it was unfortunately lost before he could examine it carefully. In June, his friend Mr. Fulton, of Granton Pier, brought him some specimens of Thaumantias, to one of which another Actinia, of the same species as the one he had before observed, had attached itself by swallowing the peduncle of the Medusa. The body of this Actinia was of a transparent yellowish-white colour, and marked by twelve paler lines, indicating the situation of the longitudinal septa within. The oral disk was oval, and formed by the basis of the tentacles and the mouth. The tentacles were twelve in number, of a rich umber-brown colour. About one-half of each from the base was marked with five opake pale-yellow lozenges, and from thence to the top by four bands of the same pale-yellow colour. The brown matter consisted of amorphous pigment-granules, the yellow matter of highly refractive and exceedingly minute molecules, apparently calcareous. Each tentacle was curved backwards, and resembled the abdomen of a wasp. The pigment could be forced through the top of the tentacle by pressure, indicating an opening at that part. The mouth, instead of being linear, as in the Actinias, tended to assume a quadrangular or crucial form, though the constantly varying shape of the disk rendered a description of it difficult. The stomach was very peculiar, and differed from that of the Actinias. It was a flat and obscurely quadrangular sac in transverse section (fig. 3). Its angles he should describe as superior (*a*), lateral (*b*), and inferior (*c*). The superior angle was connected to the parietes of the body by four septa (*d*), the lateral angles each by one septum (*e*), and the inferior angle

Fig. 3.

Transverse section of *H. Fultoni*: *a*, superior angle of stomach; *b b*, lateral angles of ditto; *c*, posterior angle of ditto; *d d d d*, *e e*, *f f*, septa, *g g g g*, intersepta, uniting stomach with parietes.

by two septa (*f*). These septa were continued downwards, as in the Actinias, to the lower extremity of the body, and had their free edges bordered by a convoluted ciliated band, furnished with cnidæ, or thread-cells. The stomach and parietes were further connected by four intersepta (*g*), as he should call them—one between each of the lateral and anterior angles of the stomach, and one between each of the lateral and posterior angles; but these intersepta bore no convoluted bands. The septa probably bore ovaries or spermaries, the intersepta not, in which case the reproductive system of the animal now described agreed in simplicity with that of the polyp of the Alcyonidæ, which had only eight septa, each bearing ciliated bands. The upper part of each of the septa and intersepta was perforated by an oval opening, so as to give an uninterrupted passage beneath the tentacles to the circulation of the fluids of the body. By tracing this passage in the Lucernarias, he had come to the conclusion that it was the homologue of the circular canal of the gymnophthalmatous Medusa. The attachments of the stomach thus resembled those of the same organ in the other Helianthoid and Alcyonian polyps; but in shape it widely differed from these. In *Actinia* and *Alcyonia* the stomach was a flattened sac, open, and evenly truncated at its lower extremity. In the animal now described the lower border of the stomach curved gently downwards from the superior to the lateral angles (fig. 4 *a*, *b*), and from the lateral to the inferior angle it bent deeply and abruptly downwards (*b*, *c*), while the last-named angle itself was produced outwards and downwards, so as to form a beaked process, as shown in the figure. The thread-cells of the tentacles are simple and unbarbed, those of the septal bands furnished with a zigzag thread. When the animal was separated from the peduncle of the Medusa and placed in a dish of sea-water, it slowly moved from place to place by the aid of the tenacious palpocils which studded the tentacles and upper part of the body, and alternately filled itself like a balloon, and emptied itself by a vermicular contraction of the

Fig. 4.



Lateral view of stomach of *H. Fultoni*: *a*, superior angle; *b*, lateral angle; *c*, inferior angle; *d d*, septa; *e e*, intersepta.

parietes, which commenced beneath the tentacles and passed backwards. When dilated, it was seen that the animal was destitute of a sucking disk, and that the posterior part of the body terminated in a funnel-shaped depression opening into the cavity of the body, and permitting ingress of water therein. During contraction this funnel was everted, and became a cone, through the apex of which the fluid was again ejected."

XIII.—*On some new Species of Mollusca from the North of China and Japan.* By Arthur Adams, F.L.S. &c.

Genus Buccinum, Linnæus.

Buccinum Japonicum, A. Adams.

B testa ovato-fusiformi; spira producta, lævigata, tenui, imperforata, epidermide corneo-fusca longitudinaliter plicata et laminata, transversim ad costas producta et fimbriata induta; anfractibus 6½, in medio angulatis, cingulis elevatis transversis acutis (circa 6 in anfractu ultimo) instructis, interstitiis lineis elevatis longitudinalibus ornatis; basi spiraliter lirata; apertura ovata, antice breviter et late canaliculata, canali emarginata; labro margine incrassato et reflexo.

Hab. Okosiri; Sea of Japan; 35 fathoms.

This is a beautiful little species of *Buccinum* proper, about an inch in length, and with the epidermis, in fresh specimens, very prettily disposed. Like most deep-water shells, it is very thin.

Genus Trichotropis, Brod. & Sow.

Trichotropis (*Iphinoë*) *quadricarinata,* A. Adams.

T. testa turbinata, subconica; spira elata, anguste umbilicata, fusca; anfractibus 4½, spiratis, postice angulatis; anfractibus superioribus carinulis rotundatis transversis et liris elevatiusculis transversis, lineis confertis elevatis obliquis undulatis decussatis; anfractu ultimo carinulis transversis rotundatis quatuor, lineis elevatis longitudinalibus decussato, basi concavo, lirulis tribus concentricis ornato; apertura semicirculari, antice producta et vix canaliculata; labio rectiusculo; labro margine biangulato.

Hab. Mino-Sima; 63 fathoms.

Genus Rissoa, Fréminville.

1. *Rissoa miranda,* A. Adams.

R. testa pyramidato-ovata, turrita, imperforata, solida, sordide alba; anfractibus 5½, convexis, longitudinaliter costatis, costis prominentibus, distantibus, in medio nodosim angulatis, interstitiis simplicibus, suturis zonula elevata instructis; anfractu ultimo ad